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**PRELIMINARY REGULATORY EVALUATION,
INITIAL REGULATORY FLEXIBILITY
DETERMINATION,
AND TRADE IMPACT ASSESSMENT**

for Notice of Proposed Rulemaking:

BRAKED ROLL CONDITIONS

**OFFICE OF AVIATION POLICY AND PLANS
AIRCRAFT REGULATORY ANALYSIS BRANCH, APO-320**

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Executive Summary

This regulatory evaluation examines the impacts of a proposal to amend the requirements for landing gear braking on transport category airplanes. The amendment would ensure that airplanes are designed to withstand main landing gear maximum braking forces.

The proposed amendment would codify current industry practice and would not impose additional costs on manufacturers of transport category airplanes. By conforming § 25.493 of the Federal Aviation Regulations (FAR) with § 25.493 of the European Joint Airworthiness Requirements (JAR), the proposed amendment would increase harmonization between American and European airworthiness standards and reduce duplicate certification costs.

The proposed amendment would not have a significant economic impact on small entities. In addition, it would not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the import of foreign airplanes into the United States. Instead, by harmonizing standards of the FAR with those of the JAR, it would lessen restraints on trade.

REGULATORY EVALUATION OF NOTICE OF PROPOSED RULEMAKING:
BRAKED ROLL CONDITIONS

I. Introduction

This regulatory evaluation examines the impacts of a proposed amendment to the braked roll conditions of § 25.493 of the Federal Aviation Regulations (FAR) to include the effects of dynamic braking. This would account for the additional dynamic loads on the nose gear and fuselage caused by the pitching motion of the airplane due to sudden application of main landing gear brakes. Current § 25.493 addresses only the loads produced by airplane weight and steady braking forces. This proposed rule would harmonize the FAR with the European Joint Aviation Requirements (JAR-25), which have included a dynamic braked roll requirement since 1988.

II. Background

Current § 25.493 of the FAR prescribes conditions that the airplane structure and landing gear must be designed to withstand during airplane taxiing with a constant (steady) application of brakes ("braked roll" condition). The braked roll condition is treated as a static equilibrium condition that accounts for the airplane weight and the added nose down force caused by steady braking; it does not account for the additional dynamic loads on the nose gear and fuselage caused by the initial pitching motion of the airplane due to sudden application of main landing gear brakes. Adequate strength has been achieved on existing airplanes through other part 25 design

requirements and manufacturers' needs to comply with the more stringent British Civil Airworthiness Regulations (BCAR) in order to sell airplanes overseas.

For many years the BCAR have included a dynamic braking condition that requires that consideration be given to the maximum likely combination of dynamic vertical reaction and sudden increase in drag load that could occur on the nose gear as a result of sudden main gear braking while encountering obstacles. U.S. designed airplanes generally have had adequate strength to meet this condition without requiring modifications. However, this may not always be the case, especially if future airplane designs are significantly different from past and current configurations in vertical and longitudinal mass distributions of fuel, payload, engine location, etc. As the takeoff weight increases with respect to landing weight, the dynamic braked roll condition can become more critical for the nose gear and fuselage due to the relocation of items of mass away from the airplane center of gravity. Without a specific dynamic braked roll condition, the current braked roll requirements do not ensure that such strength will always be present.

The European Joint Aviation Authorities (JAA) considered the BCAR braked roll condition too severe of an airplane design requirement. Nevertheless, the JAA recognized that sudden application of main gear maximum braking is an event that the airplane should be able to withstand. Since October 1988, JAR-25 has included a dynamic braked roll condition, differing from the BCAR requirement.

In 1988, the FAA and the JAA began a process to harmonize the airworthiness requirements of the United States and Europe. The objective was to achieve common certification standards without a substantive change in the level of safety provided by the regulations.

The FAA chartered the Aviation Rulemaking Advisory Committee (ARAC) in 1991 to provide advice and recommendations concerning the FAA's rulemaking program, including most harmonization rulemakings. ARAC's Loads and Dynamics Harmonization Working Group, which includes industry and government structural loads specialists from Europe, the United States, and Canada, was chartered in 1993 (58 FR 13819, March 15, 1993).

A proposal has been recommended to the FAA to add a requirement to include the effects of dynamic braking. The FAA considers the proposal to be a realistic method to account for dynamic loads that could exceed the static load requirements of current § 25.493(b). The proposed new § 25.493(e) provides a mathematical expression, in terms of airplane weight, geometry, coefficient of friction, and dynamic response factor, that may be used in the absence of a more rational analysis to account for the total nose gear loading, including the effects of dynamic braking.

III. Costs and Benefits

The proposed amendment would codify current industry practice and would not impose additional costs on manufacturers of transport category airplanes. By conforming § 25.493 of the FAR with § 25.493 of the JAR, the proposed amendment would increase harmonization between American and European airworthiness standards and reduce duplicate certification costs.

IV. Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily or disproportionately burdened by Government regulations. The RFA requires a Regulatory Flexibility Analysis, in which alternatives are considered and evaluated, if a rule is expected to have "a significant economic impact on a substantial number of small entities." FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, prescribes standards for complying with RFA review requirements in FAA rulemaking actions. The Order defines "small entities" in terms of size thresholds, "significant economic impact" in terms of annualized cost thresholds, and "substantial number" as a number which is not less than eleven and which is more than one-third of the small entities subject to the proposed or final rule.

The proposed amendment would affect manufacturers of transport category airplanes produced under new type certificates. For airplane manufacturers, Order 2100.14A specifies a size threshold for classification as a small entity as 75 or fewer employees. Since no

part 25 airplane manufacturer has 75 or fewer employees, the proposed amendment would not have a significant economic impact on a substantial number of small airplane manufacturers.

V. International Trade Impact Assessment

The proposed amendment would not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the import of foreign airplanes into the United States. Instead, by harmonizing standards of the FAR with those of the JAR, it would lessen restraints on trade.